Milwaukee
Water Works
Safe, Abundant Drinking Water.

Water Main Replacement Report

The Public Service Commission (PSC) issued the *Final Decision* in docket 3720-WR-107, the *Application of Milwaukee Water Works, in Milwaukee County, Wisconsin for Authority to Increase Water* Rates, on February 3, 2011. In that *Final Decision* on page 8, Milwaukee Water Works (MWW) was directed to "study its transmission and distribution main replacement rate and file a report with recommendations in conjunction with its next rate case". This document is in response to that directive.

Milwaukee's Water Distribution System

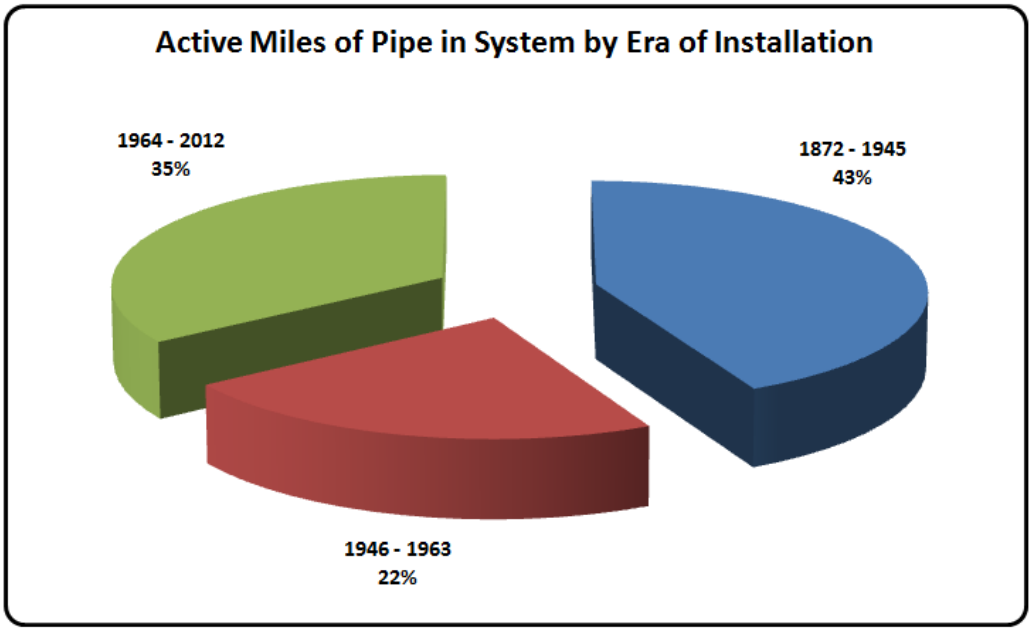
The Milwaukee Water Works distribution system contains 1,961 miles of water main in sizes from 4" to 60" in diameter. Mains up to and including 12" diameter are considered "distribution" mains; those 16" and larger are considered "transmission" mains. There are 1,510 miles of distribution mains in Milwaukee's system and 351 miles of transmission mains.

There are a number of methods to develop replacement projections for water mains. The simplest is to divide the number of miles of main by the expected life cycle. To reach a "rule of thumb" of a 100-year life cycle for the overall system, MWW would need to replace approximately 20 miles of water main each year. Using the PSC's depreciation rate of 1.3% or 77 years, replacing about 25 miles of water main each year would result in the mains being retired at the end of their depreciated life.

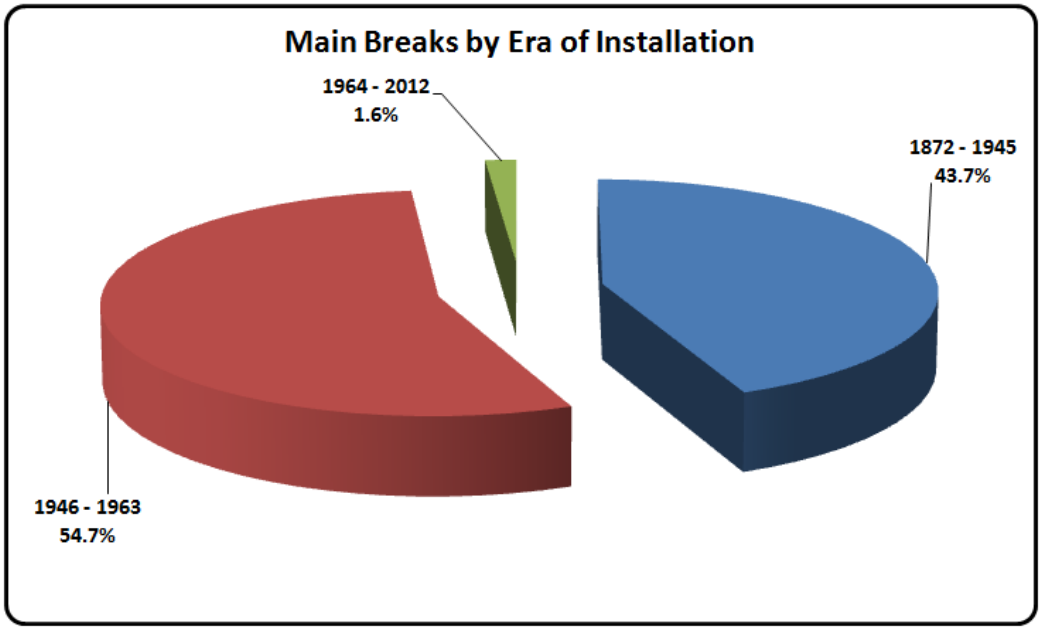
However, all water mains are not "created equal". Based on the American Water Works Association's 2012 report titled *Buried No Longer: Confronting America's Water Infrastructure Challenge*, these are the average estimated service lives of distribution pipe materials for large Midwest water utilities:

Material	Years Installed	Service Life
Cast Iron	1880 to 1943	125 years
Cast Iron (short service life)	1943 to 1963	85 years
Ductile Iron	1963 to present	110 years

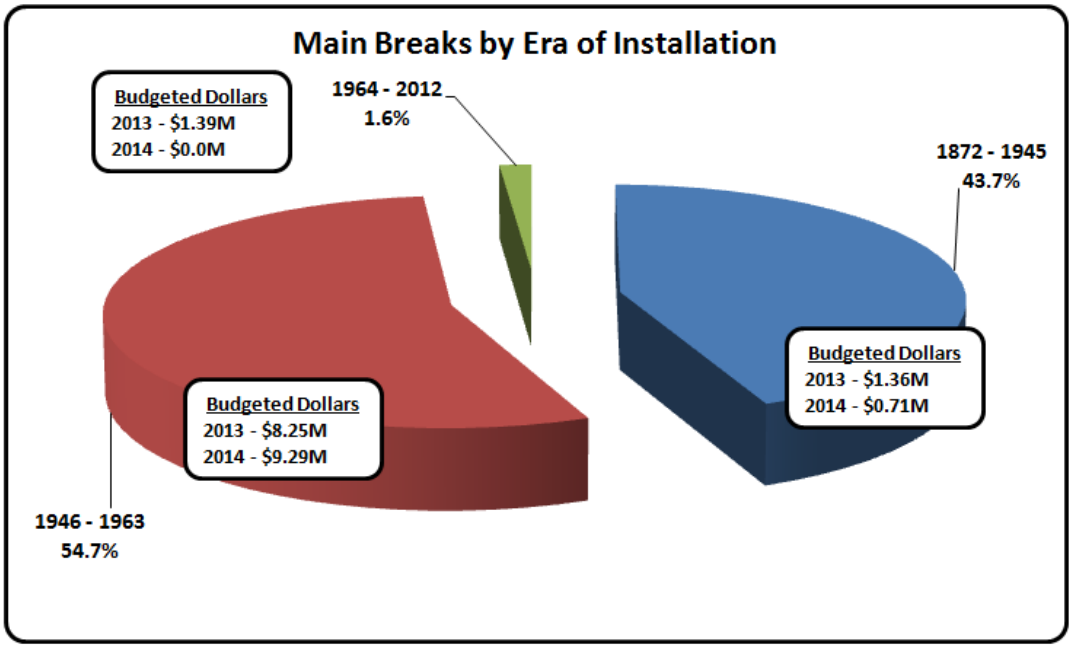
Milwaukee's distribution-sized mains can be grouped by material and installation date as follows:



An analysis of water main breaks for both distribution and transmission mains in Milwaukee's system as shown here:

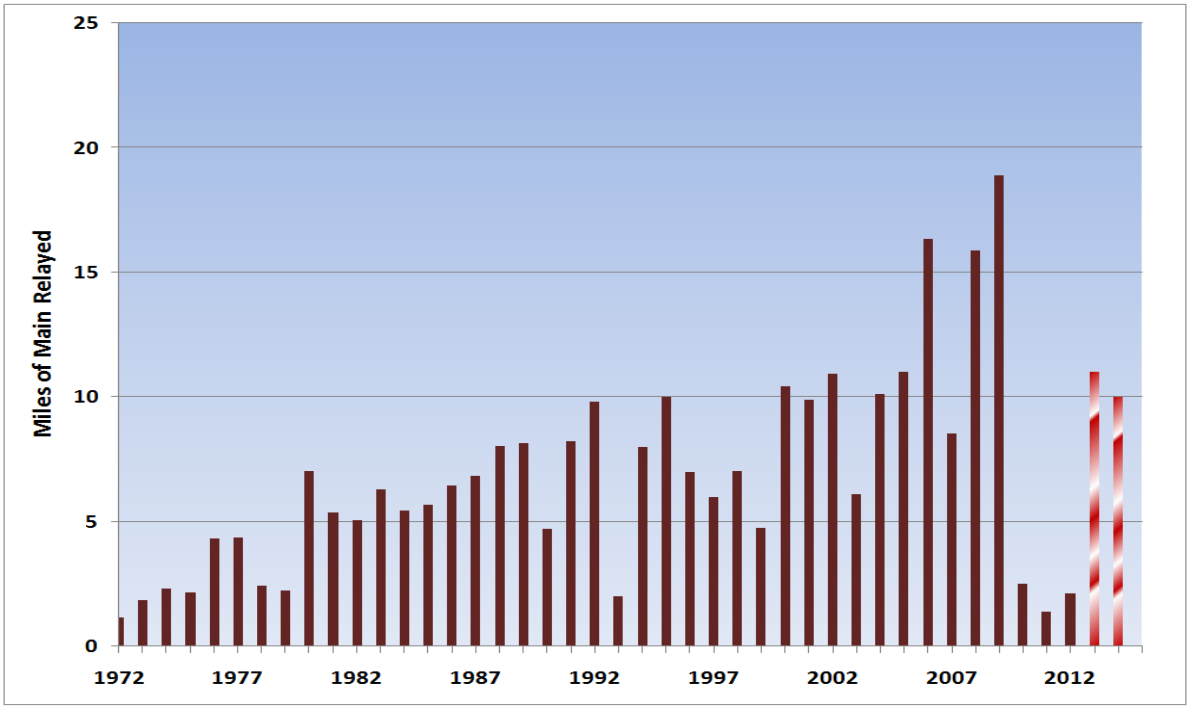


Water main replacement dollars generally target the poorest performing water mains. Here are 2013 and 2014 budgeted dollars by frequency of breaks:



Milwaukee's Water Main Replacement Program

Here is a graphical representation of water main replacements from 1972 to present:



A generally increasing trend of miles replaced is the utility's goal and is evident. Some of the year-to-year variability is due to the year that the mains were actually capitalized, which can lag the year in which the mains were installed and put into service. The very low installations in 2010 through 2012 were due to lack of available funds. Unfortunately, due to a number of factors and the lag of a protracted rate case, the utility did not realize the anticipated revenues that would have allowed for more substantial main replacements. (The average total cost to relay a water main in Milwaukee is $200 per foot, or $1,000,000 per mile.) MWW recognizes that these lower rates of replacement are not sustainable and will ultimately cost MWW and its customers more; additional money is already being invested, as shown by the highlighted bars in the chart above.

Regarding the larger transmission water mains, MWW has not had the need to replace any of these mains. The rare failures of transmission mains have been due to obvious external factors, such as construction projects in close proximity and sewer failures. Rehabilitation of these larger mains is ongoing through joint sealing projects, and the utility is beginning to perform condition assessments on these pipes.

Going Forward

MWW will continue to prioritize water mains for replacement based on their break history, hydraulic and water quality considerations, and construction projects. Our goal is to increase miles of main replaced, balancing water main replacements with other capital needs in the facilities, treatment, pumping and storage categories as finances permit.

Prepared by C. Lewis, Superintendent, Milwaukee Water Works, March 2014